great practical and economic importance. It is frequently stated that hydraulics is an empirical science because water differs from the ideal fluid to such an extent that the theoretical hydrodynamical investigations are not of much value to the hydraulic engineer. While this in a measure is true and it is necessary to resort to experiments to determine the exact form of the formulæ which express the flow of water along pipes and the co-efficients to be used in them, nevertheless, there are many problems connected with the flow of water in mains which are capable of analytical treatment, and the volume under notice has for its principal aim the discussion of these problems.

In chapter 1 the general hydraulic principles of low are discussed and empirical formulæ such as those of Chezy and Kutter are quoted, tables of coefficients to be used with them for clean pipes being given. There is no attempt whatever to give particulars of modern researches, and so far as this chapter is concerned with loss of head by friction, no experimental work done during the last thirty-five years is considered worth mentioning. As regards losses by bends and elbows recent researches have been referred to, but no consideration is given to the very important question of the change in the carrying capacity of a pipe with time. The general principles are, however, clearly discussed, and it may fairly be said that this chapter is written as an introduction to the chapters which follow, in which the problems of the surge chamber and water hammer in pipe lines are very fully discussed.

The two succeeding chapters deal very fully with stresses in pipe lines, with the materials of construction, and with the design of pipes. The last chapter of the volume deals with the flow of oil along pipe lines. The important effect of temperature on the viscosity is emphasised and a curve is given showing how the pressure drop per mile can be obtained when the temperature is changing.

There are four appendices in which certain special theoretical problems are dealt with. In Appendix 1 the general theory of pipe line flow is considered from the theory of dimensions. In this connection it is surprising to an English reader to find no reference to Lord Raleigh, or to the work of Stanton and Pannell, or Lees, and throughout the whole book there is very little reference to much important work that has been done in this country. To English readers also such symbols as (*pf2*) and (*f3s*), meaning pounds per square foot and cubic feet per second respectively, may appear a little awkward, but the notation used throughout the book is summarised at the commencement. The work should prove of value to serious students of the subject.

F. C. L.

Recollections of a Geologist.

Memories of a Long Life. By the Rev. Canon T. G. Bonney. Pp. iv+112+vii. (Cambridge: Metcalfe and Co., Ltd., 1921.)

A LIMITED edition of this little book has been printed. It is meant primarily for Cambridge readers, but will be perused with affectionate interest by the many other friends of its author. It has also some wider appeal as the unaffected and revealing life-story of a last-century Don. Not many of us can aspire to a retrospect so gratifying in its entirety; and we congratulate the author on his enviable possession.

Beginning in 1837 with the hearing of minute guns on the death of William IV., the "Memories" cover a period of over eighty years (and are happily still continuing). Of the wide scientific achievements of their narrator they tell little, but are vivid with incidents and anecdotes of his boyhood, undergraduate days, and later professional life in Cambridge and London, with recollections of eminent men and abnormal weather. In the parlance of relativity, the events for the most part pertain to a particular system of reference and would scarcely be recognisable as events in another system; but they combine, within their limits, into a concordant and sharply individualised picture of a career "crowded with culture." They exhibit a life of continuous mental and bodily activity; terms of strenuous duty alternating with pleasant vacation tours in the Alps and elsewhere, usually fruitful in scientific results; and in their long range they recall the changes, both in material things and in mental outlook, that have become apparent during their course. It is a cheerful picture, in which we may occasionally catch the trace of vigorous old controversies that, like the little whirlwinds of hot weather, have now and again raised temporary commotion within the sphere of their impact without disturbing the broad serenity of the plain.

There is strong spice in the caustic remarks on the unseemly behaviour and dress of some of the undergraduates of to-day, and in the comments on the motor-car and bicycle, the latter of which "shoots out silently from hidden byeways, the rider never dreaming of using his bell." But the good-nature underlying it all is illuminated by the episode of a happening, years and years ago, when the author, then junior Dean, cleverly detected an undergraduate in a prankish breach of order in Chapel, and brought him before the Seniority with a stern demand on its unwilling members that "if you do not send him down you must appoint some one else to sit there in future,

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for I will not"—this Draconian severity being pressed for because "the penalty was not really so heavy as it seemed, for as I privately knew the man had just kept his term"!

The index should be read; it is an epitome of the book.

Our Bookshelf.

Der Torf. Von Prof. Dr. H. Puchner. (Enke's Bibliothek für Chemie und Technik unter Berücksichtigung der Volkswirtschaft: Band I.) Pp. xvi+355. (Stuttgart: Ferdinand Enke, 1920.) 40 marks.

PEAT is always an attractive subject for the investigator, and particularly for the inventor, as it seems to promise so much in return for so little effort. It lies on the surface and needs no expensive mining operations; it is often on the top of a hill and can be run down to the consumer by gravitation, and it is capable of yielding fuel, ammonia, and various oils by distillation or heating processes, for which it can itself provide the necessary energy.

The book under notice gives a useful summary of the properties of peat, especially of those studied by the German workers, and it will prove useful to prospective investigators who wish to know something of the nature of the material they have to handle. The great difficulty up to the present has been the drying: in its natural state peat may contain 90 per cent. or more of water, and this has to be reduced considerably before economic utilisation is possible. So far no method that is generally satisfactory seems to have been evolved. The author helps by giving an account of the methods adopted in Carinthia, Oldenburg, and elsewhere, as well as a list of methods proposed or used in factories where peat is converted into saleable products. The number of methods of utilisation suggested or actually tried is considerable. During the war attempts were made in Germany and Sweden to use it for firing railway engines, but it was found necessary to fill not only the tenders but also one or two waggons with fuel if any length of journey was contemplated. Much more successful are the efforts to convert peat into power gas, and one feels on looking through the book that the problem of utilisation of peat must surely be near its solution. It would certainly add to the resources of the world if satisfactory methods could be worked out.

The Homogeneous Electro-Thermic Effect. (Including the Thomson Effect as a Special Case.) By Carl Benedicks. (Ingeniörs Vetenskaps Akademiens: Handlingar Nr. 5, 1921.) Pp. 117. (Stockholm: A.-B. Svenska Teknologföreningens Förlag; London: Chapman and Hall, Ltd., 1921.) 15*s*. net.

THE Swedish Academy is issuing in English a series of memoirs on scientific subjects in order to make the work of Swedish men of science more widely known, and the volume under notice is the fifth to be issued. It deals with the transport of heat along a conductor through which an electric current is passing, and the author concludes from his measurements that there is, in addition to the Kelvin effect, a further flow of heat with or against the electric current even when the conductor is homogeneous and originally at a uniform temperature. His measurements are in general made on long cylinders, the centre of each being turned down to a narrow neck. The electric current through the neck causes a transport of heat to one or other side of the neck, and the difference of temperature of the two sides is measured by thermo-junctions. This difference does not vary with the magnitude of the electric current according to the same law as the Kelvin effect, nor is it always of the same sign as the latter. The author proposes to call this new effect "the homogeneous electro-thermic effect."

The Wisdom of the Beasts. By C. A. Strong. Pp. x+76. (London: Constable and Co., Ltd., 1921.) 5*s*. net.

THIS is not a zoological treatise on animal instincts and the like, but a series of philosophical fables of excellent humour—indeed the prefatory quotation from the Prologue to Phædrus' Book I. makes us shrewdly suspect the author of exquisite satire directed at relativity and other scientific concepts. The fable of "The Bird and the Fish" will cause amusement to the disciples of Einstein:—a young bird, inexperienced in the phenomenon of moving air and in its effects, is set thinking by the fact that on a certain day it took less time than usual to fly from the church steeple to the stream, and more than usual to make the return flight: after much cogitation it satisfies its philosophic soul thus:—"Ah! I have it at last; what has changed is not the field, but the clock. By flying away from a clock you alter its time-keeping so that it loses, and by flying towards it you alter its time-keeping so that it gains. The time-keeping of clocks is not a fixed and unalterable thing, but depends on whether you move or stand still." And such is the style of the majority of these fables.

Analyses and Energy Values of Foods. By Dr. R. H. A. Plimmer. Pp. 255. (London: H.M.S.O., 1921.) 6*s*. net.

THIS work, which was carried out for the War Office authorities, contains the most comprehensive series of food analyses performed in the British Isles. As the author points out, they are best regarded not as a replica of but as a supplement to the very complete set of data by Atwater and Bryant, U.S. Department of Agriculture. In some cases the number of analyses is not great, but since the results are from foods as actually supplied in Great Britain, they carry more weight in this country than more numerous figures published for other countries. The tables are very carefully arranged, so that the composition of the entire food, or any part of it, may be seen at a glance. There is also an excellent summary of analyses in a form suitable for calculation. Information is given regarding the methods employed, and a short appendix tabulates the common food stuffs which do, and also those which do not contain accessory food factors or vitamins. The volume undoubtedly represents a valuable and distinct advance in knowledge.

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